FIG. 1

FIG. 2

A1: Downloading intake air amount Qa and fuel injection amount Qb

a1: Calculating excess air ratio $\lambda$, and amount Me of particulates discharged in accordance with excess air ratio $\lambda$

$\lambda$ vs. Me in map m1

A2: Calculating Mb of particulates burnt per unit time t (Mb= $\alpha \times PM \times t$)

A3:

Calculating total Mampt of Ma of particulates accumulated per unit time based on Me, Mb & Ma of discharged, burnt and accumulated particulates

Mampt > predetermined value?

Executing forced regeneration

Catalyst temperature gt (=filter temperature)

b0: Calculating fuel burning velocity coefficient $\alpha$

$\alpha$ vs. catalyst temperature map m0

Fig. 3(a) Large Small Large

Fig. 3(b) Large Small Small

Fig. 3(c) Large Small Low High

Fig. 4(a)

Determination of excess air ratio frequency Time

Fig. 4(b)

Excess air ratio frequency $\gamma$

High Low

Fig. 5(a)

Torque (fuel injection amount)

Large Large Small

Engine speed High

Fig. 5(b) Large

Fig. 6

Forced regeneration routine

S1: Calculating Me

S2: Calculating Mb

S3: Calculating Ma

S4: $Ma > Ma\alpha$

S5: Executing forced regeneration

Return

Fig. 7 Crank angle

Fig. 8

Downloading intake air amount Qa and fuel injection amount Qb

a1': Calculating excess air ratio $\lambda$

a2-1':

Calculating excess air ratio frequency $\gamma\Delta t$,
and setting 1 when excess air ratio $\lambda$ is equal to or less than predetermined value (otherwise setting 0)

a2-2':

Totaling $M\alpha\Delta t$ : $M\alpha\Delta t = f(\gamma\Delta t)$

b1:

Calculating filter temperature frequency $\beta\,\Delta t$, and setting 1 when temperature is equal to or less than the predetermined value (otherwise setting 0)

NOx/Soot ratio

A2':

Calculating particulate burning coefficient $\alpha\,\Delta t$ (= f( $\beta\,\Delta t$) ,

A3":

Calculating $Me_i$ using

$PM_i = PM_{i-1} + (M\alpha\,\Delta \qquad Mb\,\Delta t) \times \Delta t$

Ma $\geqq$ predetermined value?

Executing forced regeneration

Catalyst temperature gt (=filter temperature)

b4":

Calculating $Mb\,\Delta t$: ($Mb\,\Delta t = \alpha\,\Delta t \times PM_{i-1}$)

Fig. 9(a)

Forced regeneration (timing detection) routine

S10: Calculating $Ma\,\Delta t$

S20: Calculating $Mb\,\Delta t$

S30: Calculating $PM_i$ (= $PM_{i-1} + (Ma\,\Delta t - Mb\,\Delta t)*\Delta t$)

S40: $PM_i \geqq$ predetermined value?

S50: Executing forced regeneration

Return

Fig. 9(b)

Calculating $M\alpha\,\Delta t$

S11: Downloading Qa and Qf
S12: Calculating excess air ratio $\lambda$
S13: Calculating excess air ratio frequency $\gamma \Delta t$
S14: Calculating Ma $\Delta$ t(=f ( $\gamma$ $\Delta$ t)
End

Fig. 9(c)
Calculating Mb $\Delta$ t

s21: Downloading catalyst temperate gt

s22: Calculating filter temperature frequency $\beta \Delta t$

s23: Calculating particulate burning velocity coefficient $\alpha \Delta t$

s24: Calculating Mb $\Delta$ t (= $\alpha \Delta t \times PM_{i-1}$)

End